

28c1
Geophysical Laboratory
 2850 MONTGOMERY STREET, WASHINGTON D. C. 20540

OFFICE OF THE DIRECTOR

October 14, 1960

Dr. Clark T. Randt, Director
 Office of Life Sciences Program
 NASA Headquarters
 1520 H Street, N. W.
 Washington 25, D. C.

Dear Dr. Randt:

I have been meditating on some of the problems which your division faces in recommending a long-term research program in Space Biology and have come to feel that the possibilities of extra-terrestrial life in the solar system have been substantially overstated.

Let us consider the moon, Venus, and Mars in turn. The facility with which small molecules leave the surface and the absence of an atmosphere on the moon are well established. Some of the consequences of this are widely recognized--absence of oxygen and the penetration of intense radiation to the lunar surface. Another even more serious limitation is the absence of water. Soil exposed to a high vacuum is quickly dehydrated. Life as we know it cannot function without water. For instance, roots in soil die when the moisture content is less than 10%. It is just not realistic to suggest that the moon could serve as a medium in which earth organisms would multiply.

Suggestions that we might learn something about panspermia on the moon neglect the realities of celestial mechanics (this has been mentioned repeatedly). In addition, they do not take into account the lessons of organic geochemistry derived from studies of kerogen. Furthermore, we know that the carbonaceous chondrites have undoubtedly contributed much organic material to the moon and a really sophisticated approach would be required to discriminate between such chondritic material and any organic matter derived from another source. My feeling now is that it is ridiculous to spend time and money on sterilization of lunar vehicles.

The situation with respect to Venus is somewhat different. We are told that there is an atmosphere and that water and carbon dioxide are present. However, we are also told that the temperature of the Cytherean surface is 600 A° (327° C). Life as we know it can multiply in hot springs at temperatures near the boiling point of water. However, proteins and nucleic acids degrade at an increasingly rapid rate at higher temperatures. It would be unrealistic to

ABELSON, P.

October 14, 1960

think that life as we know it could thrive at temperatures above 130° C and sheer nonsense to suggest that it could long withstand 170° C.

There is some possibility that the estimates of Cytherean temperature are high but I doubt that they are actually below 100° C because of a well-established greenhouse effect. If I had to place odds on the survival of earth forms on Venus, I would make them no more favorable than one in a hundred. On this basis the usefulness of sterilizing a Cytherean probe seems marginal to me and if the space program were to be made substantially more costly and suffer delays because of sterilization, I would be dubious of the wisdom of decontamination of probes directed toward Venus.

Perhaps the wisest course is to emphasize the importance of obtaining temperature measurements on the Cytherean surface as a step which will permit a more solidly based decision.

The situation on Mars is again different. There is an atmosphere with carbon dioxide and some water is present. Temperatures would be reasonably favorable for life. The indication is that there is virtually no free oxygen, and Kuiper believes that the vapor pressure of water corresponds to a dew point of -90° C. If Kuiper is right, there is no terrestrial-like life on Mars because of lack of water. The principal present evidence for life on Mars is that provided by Sinton. I am not impressed by this evidence for he could well be merely looking at organic matter derived from carbonaceous chondrites.

My attitude toward life on Mars is, however, that there is a reasonably good chance that it exists. First, Kuiper may be wrong, and secondly, a different form of life could have developed there. I would definitely go along with a sterilization program for Martian vehicles. However, I feel that the first priority program should be to determine the nature of the atmosphere and water content of Mars.

Sincerely yours,

ORIGINAL SIGNED BY
PHILIP H. ABELSON

Philip H. Abelson
Consultant to Planetary and Interplanetary
Subcommittee

cc: Dr. Berkner

Dr. Newell

Dr. Hartline

Dr. Stauss

Dr. G.J.F. MacDonald

Dr. Jastrow

✓ Dr. Lederberg; Dr. Tompkins; Dr. Sagan

Members of Lunar Sciences, Plan. & Interplan. Sciences,
and Biosciences Subcommittees